

## **Toxic PFAS Chemicals Found in Artificial Turf** by Sharon Lerner

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PFAS chemicals have been identified in synthetic turf, according to lab tests performed on several samples of the artificial grass that were shared with The Intercept. The presence of the chemicals, members of a [class](#) that has been associated with multiple health problems, including cancer, adds to growing concerns about the grass replacement that covers [many thousands of acres](#) in parks, schools, professional sports stadiums, and practice fields around the U.S.

In one set of tests, the PFAS chemicals were detected in the plastic backing of two samples of the turf. In another, in which the “blades” of the artificial grass were analyzed, scientists measured significant levels of fluorine, which is seen as an indication of the presence of the chemicals.

“We’re seeing unexplained levels of fluorine-based compounds in all of the eight samples of turf grass blades we’ve looked at,” says Jeff Gearhart of the Ecology Center, a nonprofit environmental research group based in Michigan that tested the turf blades. The samples of the blades that tested positive for fluorine were made by two different companies, Shaw Industries and Turf Factory Direct.

Neither Turf Factory Direct nor Shaw Industries responded to requests for comment for this story.

PFAS chemicals are used widely to help with the molding and extrusions of plastic, according to a [2005 paper](#) from the Journal of Vinyl and Additive Technology. The latest version of the synthetic turf, which is prized for its durability, is made with plastic polymers that are molded into the shape of grass blades when in molten form.

“When you extrude plastic, it’s like a cookie cutter,” explained Graham Peaslee, a professor of nuclear physics at the University of Notre Dame who has spent the last five years studying PFAS compounds. Without the PFAS, the rigid plastic used to make the turf durable clogged up the extruding machines that make the turf. “So they added fluorochemicals and now it runs through the extruders just fine.” While other chemicals can also ease the turf-making process, “the fluorinated ones work the best,” said Peaslee, who likened the PFAS in turf to “chemical hitchhikers” that are left over from the processing rather than used as ingredients.

The Synthetic Turf Council did not respond to specific questions about the presence of PFAS in turf. In an emailed response to questions from The Intercept, Dan Bond, president and chief executive officer of the Synthetic Turf Council, wrote that “STC members are at the forefront of

technology that continuously improves the durability, performance and end of life uses of synthetic turf systems.”

## Crumb Rubber

Any threats posed by the PFAS in the blades and backing of turf add to questions that were already swirling about the crumb rubber sprinkled over it. In 2014, soccer coach Amy Griffin realized that an [alarming number of goalkeepers had developed cancer](#) after playing on turf fields and began [tallying all the athletes](#) she could find in the same situation. By January 2019, her [list](#) included 260 young football, baseball, lacrosse, and soccer players with cancer. Griffin has repeatedly called for more research. But so far, scientists have focused on the chemicals in the crumb rubber spread over turf and not on the other components of the plastic grass.

The first artificial turf, Monsanto’s “Chemgrass,” was rolled out in the Houston Astrodome in the 1960s. The prominent product placement served to not only help coin the best known brand name in fake fields — “AstroTurf” — it also launched the turf era, in which billions of dollars’ worth of green plastic carpets have replaced much of the real grass that had naturally coated sports fields up to this point.

As its manufacturers have pointed out, turf eliminates the needs for watering, mowing, and pesticides — and the turf industry trade group, the Synthetic Turf Council, counts “a host of environmental benefits” among its selling points. The latest version of artificial turf is made of bright green plastic blades attached to a sod-like base. In order to make the blades stand up in a passable imitation of grass, most synthetic turf has, since the late 1990s, required some sort of “infill,” usually crumb rubber made from shredded tires. The tiny bits of rubber are dumped on top of the blades and, according to the Synthetic Turf Council, give the turf “the look and playability of lush grass.”

But the mix of chemicals composing today’s turf are decidedly not grass. The rubber, which is used in huge amounts (some 40,000 tires are shredded to cover a single artificial turf field), contains heavy metals and other chemicals shown to pose serious health risks. [Environmental groups](#) have [taken issue](#) with the health risks of turf. And the Children’s Environmental Health Center of the Icahn School of Medicine at Mount Sinai deemed the fake grass so dangerous it called for a [moratorium](#) on new artificial fields in 2017.

In July, the Environmental Protection Agency and the Agency for Toxic Substances and Disease Registry issued the [first](#) of two reports on the recycled crumb rubber, which found dozens of metals and volatile and semi-volatile organic compounds in the black rubber specks. Several of these compounds — including cadmium, benzene, nickel, chromium, and arsenic — are known carcinogens.

The EPA cautioned that “risks cannot be inferred from the information and conclusions found in this study” and promised that a second study to be released at a later, unspecified date will look at the exposures and risks of people who play on these fields. Yet on a [webpage](#) about the study, the agency assures visitors that “while chemicals are present as expected in the tire crumb rubber, human exposure appears to be limited.”

The turf industry welcomed the EPA study as evidence that their product doesn't cause harm, but others criticized the agency's reassurances as [premature](#). The environmental group Public Employees for Environmental Responsibility went so far as to [call](#) for the EPA to retract the July report. Kyla Bennett, PEER's science policy director, criticized the federal agency for not offering evidence for its characterization of the risk from turf as low and for failing to test the crumb rubber for more than half of the chemicals that have been associated with it.

The EPA is reviewing the PEER complaint, according to an agency spokesperson.

## **Blades and Backing**

Bennett was also extremely disappointed that the EPA investigated only the crumb rubber from the fields and not the plastic grass blades and the backing to which they're attached. So she decided to test them herself. This summer, Bennett and a friend went to a sports field near her home in Massachusetts while new turf was being installed. She secured two samples and sent one of the turf pieces to a lab to be analyzed for the presence of specific PFAS chemicals.

The tests on the turf came back positive for a short-chain PFAS chemical (known as 27619-97-2) that was the subject of [risk reports](#) sent to the EPA between 2007 and 2011. While there is little published about the health effects on this chemical, [one](#) of those reports, submitted by DuPont in 2009, noted that some rats died after being exposed to the compound. [Another](#) noted that the chemical induced chromosomal aberrations in hamsters' ovary cells. Nevertheless, the chemical was approved for use and is produced in large quantities, according to EPA records.

Bennett sent the other turf piece to the Ecology Center, which found that PFAS were also in the blades of the turf. The center used a new method known as a "total fluorine" analysis. Using this technique, researchers can get a total signal for all of the PFAS that are present in products as opposed to just the 30 or so that they are now able to identify and test for individually.

The Ecology Center's Gearhart used the total fluorine test to determine that about half of the hundreds of commercial and residential carpeting samples it tested at the beginning of this year contained PFAS. And Peaslee of Notre Dame, who pioneered the total fluorine method, has used it to identify PFAS in [food packaging](#), [cosmetics](#), and in the protective gear worn by firefighters, at "[thousands of times](#) over the drinking water limit."

## **Discarded Turf**

Meanwhile Bennett found another source of turf she could test: 11 rolls of the used field covering that were sitting alongside some bags of crumb rubber a short walk from a field in Franklin, Massachusetts. New turf had been installed on the Franklin field in 2017, and the old turf had been sitting there ever since. So Bennett cut off a piece of the fraying, discarded turf and sent that for testing too. That sample came back positive for PFOS, a chemical that is no longer in use but has been recognized as both a health threat and widespread water contaminant.

Bennett also collected water from a wetland just feet from the rolls of old turf and found that PFOS was in the water as well, suggesting another possible way that this and other PFAS chemicals may be getting into water.

Asked about the discarded turf and the presence of PFOS in both the turf and nearby water, Franklin town administrator Jamie Hellen said that he wasn't aware that turf contained any dangerous chemicals. Hellen also said that he hadn't known that the rolls of old turf had been left near the water. Days later, he sent a photo of the spot where the discarded turf had been, showing that the turf was no longer there. Bennett noticed the turf rolls stashed near some trees about a mile away from where it had last been dumped, though the bags of infill were no longer nearby.

In an email, Hellen also wrote, "The Town of Franklin has excellent fields that the community is very proud of and are very safe. The Town invests millions in taxpayer dollars into making our fields the best in the state, always trying to stay on the cutting edge of what technology offers and to have the safest fields for the public."

Franklin, Massachusetts, is hardly the only place struggling with the problem of how to discard turf once it's no longer in use. Turf eventually wears out — typically within about a decade of installation — and when it does, it needs to be replaced. Between 1,200 and 1,500 new turf fields are being installed across the country each year, according to estimates from the Synthetic Turf Council.

The infill and turf for a single field can weigh 495,000 pounds, according to an estimate in recycling [guidelines](#) found on the Synthetic Turf Council's website. That document explains that "as with any recycle, reuse and recovery effort, the diversity of component materials may represent economic or technical challenges." It also notes that "the industry continues to research and identify the most economical and responsible way to process all turf components such as turf plastics, infill(s) and underlayment pads that need to be removed, recycled and reused."

Failures to dispose of used turf have recently grabbed public attention in Europe. The Dutch public television documentary program Zembla ran an [investigative report](#) showing that several companies falsely claimed to recycle turf and have instead stacked it in towering piles. And in [Norway](#), after turf was found discarded in the woods near waterways in June, the minister of the environment said he was considering new rules to control and clean up the dumping of turf.

Although asked repeatedly, the Synthetic Turf Council did not provide the name of any facility currently able to recycle turf in the U.S. But at least one company listed on the trade group's website does claim to do so. [Target Technologies International, Inc.](#), which is based in British Columbia, offers "a one-of-a-kind solution to recycle 100% of your used artificial turf and turn it into useful post-consumer products keeping it from ending up in our landfills, vacant properties and warehouses," according the copy found in the online buyers' guide and membership directory of the Synthetic Turf Council.

Asked about the company's ability to repurpose turf, Target Technologies International did not provide convincing evidence. Although a [2018 report](#) from international soccer governing body

FIFA on the environmental impact of turf fields noted that “a full ‘closed-loop’ process is yet to be developed,” Nadia Minato, who answered the phone at the Target Technologies International, said that the company has recycled every bit of “maybe 75 fields” in the past five years by sending the turf to Malaysia, where it is made into “fence posts and different kinds of lumber.”

When asked for details about where exactly in Malaysia the company sends the turf and what happens to it when it gets there, Minato replied that that information was “proprietary.” She then supplied the email address and phone number of Thomas Lam, who she said handles the “leg work” for Target Technologies International’s recycling in Malaysia. In an email sent by a third party, Lam responded to a question about how exactly the company is able to recycle 100 percent of turf with the statement, “This is one of our Trade Secrets.” Asked for the location of the company’s facility and any evidence that it actually recycles turf there, Lam responded that the plant is not open to the public and that “our recycled, marketable and environmentally safe, end product is a plastic fence post and they are available in the USA.”

Whether on a field, dumped in the woods, or sitting in a facility awaiting the advent of effective recycling methods, turf almost certainly ultimately releases its PFAS chemicals, according to Peaslee.

“The question is: Does it come off? And I’m pretty convinced from my previous research on textiles that it does,” he said. “When you expose the fibers to mechanical abrasion, some of these chemicals ooze from the fibers.” For Peaslee, the discovery of PFAS in turf is a troubling indication that the chemicals are likely present in other products for which they were used as a processing aid. “Turf is only the tip of the iceberg. It’s going to happen wherever they’re using PFAS as an extrusion agent,” said Peaslee, who expressed concern that widespread dumping of the turf in landfills and other places may result in water contamination.

For athletes and their parents, the presence of PFAS in turf may raise more immediate concerns about exposure to yet another group of troubling chemicals while playing on the fields. “We just don’t know yet how this might affect people,” said PEER’s Bennett. For her, the unanswered questions about PFAS in turf and in the water near where it is dumped should be met with caution. “Synthetic turf is now causing a risk to everyone who drinks water,” said Bennett, who thinks anyone planning to install turf fields should reconsider. “If there’s a potential for risk,” she said, “just don’t do it.”